

TITLE OF THE INVENTION

DATA BUS FOR A PLURALITY OF NODES

BACKGROUND AND SUMMARY OF THE INVENTION

5 This application claims the priority of Germany Patent Document  
198 10 292.5, filed March 10 1998 and PCT/EP99/0116, filed  
February 23, 1999, the disclosures of which are expressly  
incorporated by reference herein.

10 The invention relates to a data bus for a plurality of nodes that  
are connected to one another via a star coupler. Such a data bus  
is known from the unpublished German patent application 19720401.  
Herein, the nodes are connected to the data bus via  
transmitter/sender modules. For optical bus systems, aging of the  
transmitter diodes or frequent reverse bending fatigue of the  
optical fiber or damage thereto can lead to a reduction of  
15 luminous power to the receiver diode, thereby resulting in  
malfunctions in the bus traffic. Such an error cannot be  
automatically detected and diagnosed.

20 The object of the invention is to provide a data bus of the  
aforementioned art that detects any degradation of transmission  
quality.

Degradation of the optical transmission quality can be detected by the transmitter/receiver module. This degradation is characterized, for example, by excessive attenuation or by the difference between dark current and photocurrent (useful  
5 current).

According to an advantageous development of the invention, the frequency of faulty data transmission can be determined.

In another advantageous development of the invention, addressability of the memory element allows the simple detection of which of the node(s) caused a faulty data transmission. As an  
10 example, the status of the memory element can be read out by a microcontroller assigned to the star coupler, via a serial interface (SPI, for example).

Subsequently, the memory element, for example, after a faulty  
15 transmission or after readout by the microcontroller, can be reset. Thus, the subsequently occurring faulty data transmission can be detected and distinguished from the preceding error.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed  
20 description of the invention when considered in conjunction with the accompanying drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The invention is illustrated by the single figure which shows detail representation of a data bus according to the invention whereby the mode of transmission of the nodes is monitored.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Two nodes  $T_n$  and  $T_{n+1}$  are connected via S/E (transmit/receive) modules  $S/E_n$  and  $S/E_{n+1}$ . The  $S/E_n$  and  $S/E_{n+1}$  modules convert optical messages in electric form received from said  $T_n$  and  $T_{n+1}$  nodes and relay the signals  $Di_n$ ,  $Di_{n+1}$  as input signals to a logical decision gate (AND Gate 1) as the central component of a star coupler K. The number of inputs and outputs of AND Gate 1 corresponds to the number of bus nodes. The output of AND Gate 1 drives all inputs ( $Do_n$ ,  $Do_{n+1}$ ) of the  $S/E_n$  and  $S/E_{n+1}$  modules. The modules convert these electrical signals into optical signals for transmission to the  $T_n$  and  $T_{n+1}$  nodes via optical transmission segments.

Degradation of the optical transmission quality due to excessive attenuation or difference between dark current and photocurrent  $U$ , can be detected by the transmit/receive module  $S/E_n$  or  $S/E_{n+1}$ .

During a low level at the optical data input of the module, a detected error is reported at the data output of the star coupler via a brief low impulse as an additional input signal  $Di_n$ ,  $Di_{n+1}$ .

This error state is stored at each input of the star coupler in a buffer (7). A counter is assigned to each signal input. The counter 8 is, within the time of a transmission, incremented by one if an error is reported by the corresponding S/E module. The counters can be read out and reset via a serial interface (SPI, for example) of a microcontroller. With this function, the optical transmission paths of all bus nodes can be diagnosed.

The foregoing disclosure has been set forth merely to illustrate the invention and is not intended to be limiting. Since modifications of the disclosed embodiments incorporating the spirit and substance of the invention may occur to persons skilled in the art, the invention should be construed to include everything within the scope of the appended claims and equivalents thereof.